WHAT IS CLAIMED IS:

1. An axial-gap motor comprising:

a stator frame;

a plurality of electromagnet units which are arranged on the stator frame;

a rotor frame which is spaced apart from the stator frame by a predetermined distance;

a plurality of permanent magnet units which are provided on the rotor frame, which oppose the electromagnet units across an axial gap and each of which has a magnetic-field centerline that intersects with a magnetic-field centerline of the electromagnet unit as viewed in a radial direction;

a sensor unit which detects a positional relation of the electromagnet units and permanent magnet units; and

a drive unit which detects, from an output of the sensor unit, that each of the permanent magnet units has rotated by a predetermined angle from the position where magnetic poles of the permanent magnet units substantially opposes magnetic poles of the electromagnet units and which supplies an excitation current to the electromagnet units, so as to repulse the magnetic poles of the permanent magnet units and the magnetic poles of the electromagnet units, through the predetermined angle.

2. The axial-gap motor according to claim 1,

wherein θ11 + θ12 + θ13)/number of poles of the rotor = 360°, the drive unit comprises means for supplying the excitation current to the electromagnet units in accordance with the output of the sensor unit such that θ11 is a period in which the permanent magnet units remain close to the electromagnet units and the excitation current is not supplied, θ12 is a period in which the magnetic fields of the electromagnet units repel the magnetic fields of the permanent magnet units and the excitation current is supplied, and θ13 is a period in which the excitation current is not supplied.

3. The axial-gap motor according to claim 1, wherein θ21 + θ22 + θ23 + θ24)/number of poles of the rotor = 360°, the drive unit comprises means for supplying the excitation current to the electromagnet units in accordance with the output of the sensor unit such that θ21 is a period in which the permanent magnet units remain close to the electromagnet units and the excitation current is not supplied, θ22 is a period in which the electromagnet units magnetically repel the permanent magnet units and the excitation current is supplied, θ23 is a period in which the excitation current is not supplied, and θ24 is a period in which the electromagnet units magnetically attract the permanent magnet units and the excitation current is

supplied.

4. The axial-gap motor according to claim 1, wherein each of the electromagnet units has a magnetic-pole surface each which is orientated in an axial direction.

5. The axial-gap motor according to claim 1, wherein the electromagnet units are arranged on the stator frame and spaced apart at regular intervals, irregular intervals, or regular and irregular intervals in a circumferential direction.

6. The axial-gap motor according to claim 1, wherein the electromagnet units are arranged on the stator frame in one or more stages in the radial direction.

7. The axial-gap motor according to claim 1, wherein each of the electromagnet units comprises at least one of an I-shaped core and a U-shaped core and a coil wound around said at least one of the cores.

8. The axial-gap motor according to claim 1, wherein each of the electromagnet units comprises a C-shaped yoke having a gap in which one permanent magnet unit on the rotor frame is arranged, and coils wound around the end portions of the yoke, respectively.

9. The axial-gap motor according to claim 1, wherein each of the electromagnet units comprises a plurality of C-shaped yokes provided on one side of

the stator frame and straddling one permanent magnet unit on the rotor frame, a plurality of C-shaped yokes provided on the other side of the rotor frame and straddling the permanent magnet unit on the rotor frame, and coils wound around end portions of each of these yokes.

10. The axial-gap motor according to claim 1, wherein each of the electromagnet units comprises a first yoke arranged on one side of the stator frame, straddling one permanent magnet unit on the rotor frame and having one end opposing the permanent magnet unit on the stator frame, and a second yoke arranged on the other side of the stator frame, straddling the permanent magnet unit on the rotor frame and having one end opposing the permanent magnet unit on the stator frame.

11. The axial-gap motor according to claim 1, wherein the rotor frame has a wall opposing the stator frame and a plurality of grooves made in the wall, extending in the radial direction and provided for holding the permanent magnet units.

12. The axial-gap motor according to claim 1, wherein each of the permanent magnet units has a magnetic-pole surface which is orientated in an axial direction.

13. The axial-gap motor according to claim 1, wherein the permanent magnets are arranged on the

rotor frame in a circumferential direction, with adjacent magnetic poles having the same polarity, different polarity or the same polarity and different polarities and spaced apart at regular intervals, irregular intervals or regular and irregular intervals.

14. The axial-gap motor according to claim 1, wherein the permanent magnets are arranged on the rotor frame in a circumferential direction and in one or more stages, with adjacent magnetic poles having the same polarity, different polarity or the same polarity and different polarities.

15. The axial-gap motor according to claim 1, wherein some of the permanent magnet units are arranged on one wall of the rotor frame, which extends in the axial direction, and the remaining permanent magnet units are arranged on the other wall of the rotor frame, which extends in the axial direction.

16. The axial-gap motor according to claim 1, wherein each of the permanent magnet units comprises a first permanent magnet piece arranged on one wall of the rotor frame, which extends in the axial direction, a second permanent magnet piece arranged on the other wall of the rotor frame, which extends in the axial direction, and a third permanent magnet piece arranged between the first and second permanent

magnet pieces.

17. The axial-gap motor according to claim 1, wherein at least one part of the rotor frame on which the permanent magnet units are provided is made of titanium.

18. The axial-gap motor according to claim 1, wherein another rotor frame is provided on that side of the stator frame which faces away from said rotor frame, and other electromagnet units are arranged on the other rotor frame and spaced apart from the permanent magnet units across a predetermined axial gap.

19. The axial-gap motor according to claim 1, further comprising:

a shaft which is coupled to the rotor frame;

bearings which support the shaft; and

a base in which the bearing are provided.

20. The axial-gap motor according to claim 1 or 18, wherein a flywheel is arranged on the rotor frame.

21. The axial-gap motor according to claim 1 or 18, wherein a mechanism is provided to combine the rotor frame and the shaft together and separate the rotor frame and the shaft from each other.

22. The axial-gap motor according to claim 20, further comprising a gearbox which change a rotational speed of the shaft.